

REMARKS

Claims 1-48 are pending in this application. By this Amendment, claim 4 is canceled, claims 1-3 and 5-34 are amended, and new claims 35-48 are added. Support for these amendments can be found in the specification as filed. Thus, no new matter is added.

The courtesies extended to Applicants' representative by Examiner Angebrannt during the May 22, 2003 personal interview are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

Rejections Under 35 U.S.C. §102

The Office Action rejects claims 15-18, 27 and 29-32 under 35 U.S.C. §102(b) as unpatentable over U.S. Patent 5,026,590 to Nakajima et al. (Nakajima). The Office Action also rejects claims 15-18, 27 and 29-32 under 35 U.S.C. §102(b) as unpatentable over U.S. Patent 5,013,629 to Sekine et al. (Sekine). The Office Action further rejects claims 15-18, 27 and 29-32 under 35 U.S.C. §102(b) as unpatentable over U.S. Patent 4,948,695 to Matsushita et al. (Matsushita). In addition, the Office Action rejects claims 15-18, 27 and 29-32 under 35 U.S.C. §102(e) as unpatentable over U.S. Patent 6,303,259 to Kubo et al. (Kubo). Applicants respectfully traverse these rejections.

Claim 15 sets forth a matrix of particles where the particles comprising a liquid core resin containing at least one photosensitive compound, an inner shell resin encapsulating the liquid core, and an outer shell resin encapsulating the core resin and the inner shell resin, where the outer shell resin forms a continuous phase of the matrix, and the particles are arranged in an array in the matrix. Claim 36 recites similar features. Claim 35 sets forth a method for storing information using a three dimensional optical memory storage device, the method comprising selecting at least one individual particle of the nanocomposite, and

irradiating the at least one individual particle with two-photon irradiation. Claims 45 and 46 recite similar methods.

In contrast to the subject matter of claim 15-48, and as agreed during the May 22 personal interview, none of the cited references teach, disclose or suggest using the particles in a matrix array. All of the cited references teach particles in a resin, but none disclose, teach or suggest that the particles are arranged in an array within the resin. Thus, none of the cited references teach all of the features of claims 15-48. Thus, none of the cited references anticipate the subject matter of these claims.

For at least these reasons, claims 15-18, 27 and 29-32 and new claims 35-48 are patentable over Nakajima, over Sekine, over Matsushita, and over Kubo. Accordingly, reconsideration and withdrawal of the rejections is requested.

Rejections Under 35 U.S.C. §103(a)

The Office Action rejects claims 1-34 under 35 U.S.C. §103(a) as allegedly unpatentable over Kalinina et al., "A 'Core-Shell' Approach to Producing 3D Polymer Nanocomposites", *Macromolecules*, Vol. 32 (1999) pp. 4122-4129 (Kalinina), in view of Matsushita or Sekine. Applicants respectfully traverse this rejection.

Claim 1 sets forth a method for storing information using a three dimensional optical memory storage device, the method comprising subjecting a nanocomposite to irradiation. Claims 35, 45 and 46, as discussed above, set forth similar methods. Claim 15, as discussed above, sets forth a matrix of particles where the particles comprising a liquid core resin containing at least one photosensitive compound, an inner shell resin encapsulating the liquid core, and an outer shell resin encapsulating the core resin and the inner shell resin, where the outer shell resin forms a continuous phase of the matrix, and the particles are arranged in an array in the matrix. Claim 37 recites similar features.

Kalinina teaches a method for producing a three-dimensional polymeric nanocomposite, comprising a hard core and a soft inert shell in a polymer matrix. Specifically, Kalinina teaches that the glass transition temperature of the core is greater than the glass transition temperature of the shells. See Kalinina, fig. 1. In contrast to claims 1-48, Kalinina does not disclose, teach or suggest the use of a liquid core in the core-shell structures of a nanocomposite. At most, Kalinina teaches that cross-linking of the shell forming polymer can produce core-shell particles with rigid shells and soft cores, which can be later dissolved to create a porous film. Thus, Kalinina teaches only a method of making an ordered nanocomposite of core-shell particles having hard cores or core-shell particles where the soft core has been dissolved and removed. Thus, Kalinina does not disclose, teach or suggest the nanocomposite of the claimed invention.

Matsushita and Sekine, alone or in combination, cannot remedy these deficiencies of Kalinina. Thus, Kalinina, Matsushita and Sekine, alone or in combination, cannot support a rejection under 35 U.S.C. §103(a) of the claims directed to a nanocomposite.

As discussed above with respect to the rejections under 35 U.S.C. §102, neither Matsushita nor Sekine disclose, teach or suggest the nanocomposite of claims 15 or 37. Neither reference contains any motivation to substitute the particles of either Matsushita or Sekine for the hard core core-shell particles of Kalinina, or for the core-shell particles in which the soft core has been dissolved to form pores in the nanocomposite. Likewise, Kalinina contains no motivation to substitute liquid core core-shell particles into its nanocomposite. Neither Matsushita nor Sekine contains any motivation to order their particles in a matrix array. Thus, Kalinina, Matsushita and Sekine, alone or in combination, do not disclose, teach or suggest the nanocomposites of claims 15-34 or 37-44.

Additionally, Kalinina also does not disclose, teach or suggest the method of irradiating the nanocomposite. Kalinina, at most, alludes to the possibility of using

nanocomposites such as those described in the reference for three-dimensional memory storage and to local photobleaching. Kalinina itself does not teach the method of two-photon irradiation of claims 1 and 35.

Kalinina simply directs the reader's attention to the possibility of photobleaching, by referring to E. Kumacheva et al., Three Dimensional Arrays in Polymer Nanocomposites, *Adv. Mater.*, **1999**, *11*, No. 3, p. 231-234 (Kumacheva), which is cited for the first time in the attached Information Disclosure Statement. Kumacheva describes nanocomposites similar to the nanocomposites of Kalinina, and a process of photobleaching the nanocomposite using two-photon irradiation.

Kumacheva describes recording "marks" in the bulk nanocomposite by successively photoirradiating different planes of the nanocomposite. However, this differs from the method of claim 1 and claim 35, which set forth selecting at least one individual particle and irradiating the at least one individual particle with two-photon irradiation. Kumacheva does not disclose, teach or suggest selecting and photoirradiating individual particles. Further, claims 1 and 35 set forth that, in response to the two-photon irradiation, the at least one individual particle is photobleached by at least about 50%, and at least one individual particle adjacent to the selected at least one individual particle is photobleached by no more than about 25 %. Kumacheva describes only "marks" recorded in the bulk nanocomposite, but does not disclose, teach or suggest selectivity at the particle level or intensity of the photobleaching of the marked areas relative to the surrounding nanocomposite material.

Based on the teachings of Kalinina, even in light of Kumacheva, one of ordinary skill in the art would, at most, find it obvious to try various methods of photobleaching. The methods of claims 1 and 35, selecting at least one individual particle of the nanocomposite; and irradiating the at least one individual particle with two-photon irradiation, where in response to the two-photon irradiation, the at least one individual particle is photobleached by

at least about 50%, and at least one individual particle adjacent to the selected at least one individual particle is photobleached by no more than about 25 %, are nowhere suggested, disclosed or taught by Kalinina or Kumacheva.

Matsushita and Sekine, alone or in combination, cannot remedy these deficiencies of Kalinina. Thus, Kalinina, Matsushita and Sekine, alone or in combination, cannot support a rejection under 35 U.S.C. §103(a) of the claims directed to a method of irradiating the nanocomposite.

Neither Matsushita nor Sekine disclose, teach or suggest the methods recited in claims 1-14, 35-36 and 45-48. In particular, neither discloses, teaches or suggests photobleaching selected individual particles of a nanocomposite. Matsushita and Sekine, either alone or in combination, do not disclose, teach or suggest selecting individual particles within a nanocomposite and irradiating the selected individual particles, or irradiating the selected individual particles by using a two-photon irradiation of a wavelength effective for photobleaching the selected individual particles.

Further, there is no motivation in Kalinina, Matsushita or Sekine to combine the references or to alter the disclosures to obtain the subject matter recited in claims 1-14 or 35. None of these references describe a method of selecting at least one individual particle of the nanocomposite and irradiating the at least one individual particle with two-photon irradiation, where, in response to the two-photon irradiation, the at least one individual particle is photobleached. Thus, Kalinina, Matsushita and Sekine, either alone or in combination, do not disclose, teach or suggest the nanocomposites of claims 1-14, 35-36 or 45-48.

Therefore, Kalinina, in combination with either Matsushita or Sekine, cannot render claims 1-48 obvious under 35 U.S.C. §103(a). Accordingly, reconsideration and withdrawal of the rejection of claims 1-34 is respectfully requested.

Conclusion

In view of the foregoing, Applicants respectfully submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-48 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachments:

Amendment Transmittal
Information Disclosure Statement with PTO form 1449 and 1 reference

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